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STUDIES OF THE INNER SHELF AND COASTAL SEDIMENTATION ENVIRONMENT OF
THE BEAUFORT SEA FROM ERTS-1

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Type I Progress Report
ERTS-1

- (A) Studies of the Inner Shelf and Coastal Sedimentation Environment of the Beaufort Sea from ERTS-1

ERTS-A Proposal No.: SR-206 Subdisciplines: 3I, 4C, 5B, 5E,
5F, 5G, 5H, 7D

- (B) GSFC ID No. of P.I.: IN-394

- (C) Statement and explanation of any problems that are impeding the the progress of the investigation.

With the onset of sufficient sun for imagery in the study area around the first of March we have begun analysis of ice movements related to bathymetry. Our study has been impeded by the inconsistent and out-of-sequence reception of data. We never know what imagery may still be processed for our use.

- (D) Discussion of the accomplishments during the reporting period and those planned for the next reporting period.

(1) An analysis of high resolution seismic records obtained in the test site area is almost complete. We have been fairly successful in delineating the thickness and distribution of Holocene sediment on the Northern Alaska shelf.

(2) Suspended particulate transport for the 1971 and 1972 open season has been fully analyzed. A manuscript discussing the yearly differences has been prepared and will be incorporated in a report on the marine geology of the Beaufort Sea shelf.

(3) As 1973 imagery is being received the pack ice-shorefast ice boundary is being mapped. This boundary is then being compared

to the known bathymetry and bottom features in the area. This zone has been selected as a locus of intensive field investigations during the 1973 open season from the R/V LOON.

(4) A field program is planned for the initial melting and river overflow onto the sea ice off the Colville River during late May and early June 1973. Data to be collected include suspended sediments, turbidity, currents, temperatures and salinities. Two current meters will be implanted near the bottom to record water movements from June through the melting of the fast ice in July and during the open season. These meters will be recovered from the R/V LOON late in August. The May-June field studies will be conducted in conjunction with a study by H. F. Walker, from LSU, of the river and delta flow phenomenon.

(E) Discussion of significant scientific results and their relationships to practical applications of operational problems including estimates of the cost benefits of any significant results.

(1) The particulate transport processes involved in the movement of surficial waters were examined using secchi disc readings, light attenuation coefficients and particulate weights from filtration. Observations gathered during the summers of 1971 and 1972 indicate a remarkable difference in particulate matter and turbidity between the two years. Concentrations of particulate matter in 1972 were about double those of the previous year (avg. 2.8 mg/l in 1972 and avg. 1.0 mg/l in 1971). Values of turbidity as light attenuation coefficients also indicate less particulate matter in 1971.

ERTS-1 imagery during August 1972 shows turbid water along the northern Alaska coast. The uniformity of distribution of the turbid water and the fact that the river discharge is low at this period of the season suggest that the turbidity is related to causes other than river effluent. Furthermore, a decrease in ice concentration and a resultant increase in wave activity indicate that much of the increased particulate suspension and transport results from wave surge on the bottom sediments along the coast. Aerial observations late in August confirmed this, as the water was more turbid outside than within the lagoons, where river water entered but wave activity was minimal. Thus wave activity and bottom disturbance by drifting ice outside the lagoons were more instrumental in putting sediment into suspension than were the rivers. This study would indicate that wave action is a more significant factor influencing particulate transport than believed heretofore. An additional factor contributing to higher water turbidity in 1972 apparently was increased primary productivity, often observed as translucent particulate matter in diving operations.

(2) The boundary between the essentially immobile shorefast ice and the moving pack ice has been plotted from several ERTS-1 images and found to occur fairly consistently along the 20 meter contour. Considering the vast difference in the amount of ice movement shoreward and seaward of this boundary, ice-bottom interaction should also be different on either side of this boundary

and for that matter at the shear zone that develops along the boundary. This zone will be studied in detail during the summer of 1973.

- (F) A listing of published articles, and/or papers, pre-prints, in-house reports, abstracts of talks, that were released during the reporting period.

Barnes, P. W., Reimnitz, Erk, Gustafson, C. W., and Larsen, B. R., 1973, USGS marine geologic studies in the Beaufort Sea off Northern Alaska, 1970 through 1973, data type and location: U.S. Geol. Survey open-file report, 38 p.

Barnes, P. W., and Reimnitz, Erk, in press, New insights into the influence of ice on the coastal marine environment of the Beaufort Sea, Alaska: To be published by NASA as Symposium Proceedings, 8 p. including figures.

Reimnitz, Erk, Rodeick, C. A., and Wolf, S. C., manuscript approved by Director, Strudel scour: a unique marine geologic phenomenon: To be sent to Jour. Sed. Petrology.

- (G) Recommendation concerning practical changes in operations, additional investigative effort, correlation of effort and/or results as related to a maximum utilization of the ERTS system:

A two-month extension of our investigation into September 1973 is being requested through EROS, at no cost to NASA other than the additional imagery. Our operations will again span the initial melting and the remainder of the open season until the middle of September, in an attempt to study one complete summer season. In

1972 our efforts were thwarted by the late launch of ERTS. It is imperative for the success of our investigation that ERTS-1 imagery be continued through our field operations, which will end in September.

(H) Changes in standing orders this period: none

(I) ERTS Descriptor forms: none

(J) Change of Data Request forms this period: none

(K) N/A